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		Application Number	10/042,475
		Filing Date	January 9, 2002
		First Named Inventor	Kenneth E. Dahlberg
		Group Art Unit	2128
		Examiner Name	Saif A. Alhija
Total number of pages in this submission		Attorney Docket Number	PM 98.086

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### SIGNATURE OF APPLICANT, ATTORNEY OR AGENT

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Date	23 October 2006

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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF APPEALS AND INTERFERENCES**

In re application of:	§	Confirmation No.: <b>6077</b>
Kenneth E. Dahlberg	§	
	§	
Serial No.: <b>10/042,475</b>	§	Examiner: <b>Saif A. Alhija</b>
	§	
Filed: <b>January 9, 2002</b>	§	Group Art Unit: <b>2128</b>
	§	
Title: <b>"VOLUMETRIC LAMINATED SAND ANALYSIS"</b>	§	
	§	

**REPLY BRIEF**

MS: Appeal Brief  
 Commissioner for Patents  
 P. O. Box 1450  
 Alexandria, VA 22313-1450

Sir:

This is in response to the examiner's answer mailed September 7, 2006.

**RESPONSE TO EXAMINER'S ANSWER**

*Summary of Claimed Subject Matter*

Step (a) of claim 1 reads as follows:

(a) defining an initial model of the subsurface formation based upon estimates of different bed types and bed-type parameters in the formation, one of said bed-type parameters being aspect ratio, the initial model including a system of log equations for predicting well logs from bed-type parameters;

The examiner writes, "Although the claim recites aspect ratio, it does not require it." It appears that the examiner is raising a claim construction issue. His argument reduces to the assertion that the phrase "one of said bed-type parameters

“being aspect ratio” is surplus wording in the claim, devoid of content. In other words, the examiner’s reading of the quoted claim limitation is as though it were instead written: “one of said bed-type parameters optionally being aspect ratio,” which is equivalent to omitting the clause altogether. But that is not what the claim says. What it says is that what bed-type parameters are selected to construct the model around is left to the user, except that one of them must be aspect ratio. The appellant submits that this is the plain meaning of the words. [MPEP 2111.01] The examiner is reading a limitation out of the claim. The result is an unreasonable interpretation that goes beyond the “broadest reasonable interpretation” directive of USPTO policy as expressed in MPEP 2111.

Furthermore, patents are subject to the same rules as are used to construe any written instrument (*Chisum on Patents* 5A, § 18.03[2][a]), one of which is a presumption against surplus wording where there is an interpretation of the words that renders them meaningful. The examiner agrees that claims are to be interpreted in light of the specification. In this regard, attention is directed to paragraph 9 of the application, the second sentence: “For each bed type, estimates are made of the relevant petrophysical properties (e.g., porosity, water saturation and thickness within the interval), aspect ratio, and any other parameter as may be desired based on core data or regional knowledge.” (Emphasis added) This limitation is not being “read into the claims” as the examiner suggests, because the clause “one of said bed-type parameters being aspect ratio” is already present in the claim. The appellant believes that this clause is unambiguous, and fully consistent with the specification as well. The appellant respectfully submits that it is unreasonable and improper to dismiss these words as an extraneous recitation, devoid of significance. Yet this is, in effect, the examiner’s position.

In any event, the appellant’s case against Malinverno is equally made by the model’s being based on *bed types*, which the examiner does not dispute is required by claim 1. Thus, even if for the sake of argument the examiner were correct in his interpretation of claim 1, it would not change the outcome on the issue on appeal. It may be noted here that the “bed type” feature (along with *bed-type parameters*) alerts

the ordinary artisan that claim 1 does not read on traditional (explicit) model building, which is all that is mentioned in Malinverno.

### ***General Remarks***

In this part of its Reply Brief, the appellant responds to some arguments that recur in the Answer and which the appellant believes are incorrect. Using Malinverno as an example, the examiner asserts that even though Malinverno never mentions even the concept of aspect ratio, his “layered earth” approach nevertheless “will inherently have as a parameter an aspect ratio and this ratio will fall somewhere in the range [0 to 1] provided by the specification of the instant application.”

The examiner uses the word *inherently*, but the appellant believes the word was not used in the term of art sense of asserting that the prior art may be deemed to disclose for novelty purposes a feature that is not literally disclosed but is thought to be *inherent*. To assert that, the examiner must show that the missing feature is not just possible or even probable, but instead would occur in every single application, whether by Malinverno or anyone else. See, for example, *In re Robertson*, 169 F.3d 743, 49 U.S.P.Q. 2d 1949 (Fed. Cir. 1999); also, MPEP 2112 (IV). In the present case, the examiner would have to show that although not mentioned in the document, Malinverno must necessarily have estimated aspect ratio for each bed type, and used it as one of the parameters for construction of his model. The examiner makes no such showing, nor could he in the appellant’s opinion since the appellant is not aware of even one reference that teaches using aspect ratio as a model-building parameter.

Instead of using *inherently* in this sense, it appears that the examiner is maintaining that prior art modeling approaches that don’t teach aspect ratio (ratio of bed thickness to bed width) as a model parameter do in effect include an estimate of aspect ratio because the beds being modeled in a selected interval will in reality have some average aspect ratio, and therefore such models implicitly incorporate some estimate of aspect ratio. The appellant’s response to this is that such activity does not fall within claim 1. The active steps of the method of claim 1 include (1) estimating aspect ratio for each bed type, and (2) including that estimated value as a model

parameter. Neither of these steps are taught or suggested by Malinverno. The most that can be inferred from Malinverno (this is not actually stated), is that nothing prevents (in principle) explicitly accounting for thin beds in traditional model building. This is the “inherent” feature urged by the examiner, and it does not fall under the present application’s claims.

In fact, Malinverno doesn’t provide *any* particular approach designed to deal specifically with the technical problem addressed by the present application, i.e. one or more depth intervals having many thin beds, particularly (but not necessarily) where the thin beds are of finite ( $>0$ ) aspect ratio as illustrated by the lower two of the three intervals shown in the present application’s Fig. 1. The closest that Malinverno comes to addressing this problem may be the paragraph in the middle of page 8 (the same paragraph also relied upon by the examiner), where he briefly suggests (without having thin beds in mind) three possible modeling approaches, all quite traditional and well known. One is the layered model, typically a 1D model but possibly 2D. The other two are 3D models where one could (at prohibitive cost in computer resources) make the cells small enough to represent thin layers of the type shown in Fig. 1 explicitly. No bed types are identified in any such approach and no aspect ratio is estimated for each bed type. The examiner asserts that the layered model would implicitly fulfill the present claim’s step of estimating bed types. The appellant disagrees. All that Malinverno is saying in the second paragraph of page 8 is that one could use a 1D or 2D layered model of the subsurface or one could use a 3D model that divides the subsurface volume into regular or irregular cells. The 3D models would have a single value for each selected “material property” in a given cell. The 1D layered model would have a single value per layer or the value might vary with depth. These material property values would be estimated and assigned as active steps of the method. But aspect ratio is not a material parameter. There is nothing in Malinverno to even hint that aspect ratio is considered a pseudo material parameter. There are no bed types estimated in any of Malinverno’s three modeling approaches, nor is aspect ratio estimated for each bed type. A layer in a 1D model or a cell or cluster of cells in a 3D model might be the model maker’s estimate of a bed, but not

of a bed *type*. There can be no estimate of aspect ratio for each bed type because no bed types have been defined and in any event no aspect ratios are estimated as an active step in the model building process as required by claim 1.

Regarding what activity claim 1 of the present application reads on, the appellant believes that no ordinary artisan in this technical field would read claim 1 and interpret the above-quoted step (a) to be describing traditional model building as summarized by Malinverno on page 8 – particularly after noting in the claim preamble that the invention is for dealing with a “formation having thinly interbedded sandstone and shale layers.” It would be unavoidable to such a reader that bed types and bed type parameters including aspect ratio refer to model parameters that must be estimated and provided by the user to build the model. This interpretation would be reinforced by the preamble because the reader would realize that explicit representation of thin beds to the degree that aspect ratio is accounted for *by running the model* (as opposed to inputting aspect ratio estimates to the model as a model parameter) would be prohibitive in terms of computer resources. It is instructive to understand in this regard that the upper analysis interval in the application’s Fig. 1 is in fact **not** a suitable formation for the layered model approach that Malinverno speaks of on page 8. Figure 1 illustrates very thin beds. Due to computer limitations, the entire first analysis interval might be one layer in a traditional layered 1D model. This reality would lead the artisan to understand that Malinverno provides no way to deal with how one would arrive at the material properties to assign to the model for such a layer. With all of this as background knowledge, the skilled artisan would understand that bed types and bed type parameters including aspect ratio are model parameters that must be estimated and provided by the user, telling the artisan immediately that traditional models such as those alluded to by Malinverno on page 8, where structure must be represented explicitly or be largely ignored, are not within the scope of this claim.

The examiner states that “layered earth with material properties” (Malinverno, page 8) “meets the definition of bed types, as defined in the specification.” As discussed above, the appellant believes this is incorrect. Malinverno is referring to

traditional 1D or 2D modeling where the number of layers has nothing whatever to do with the number of bed *types* one might identify following the teachings of the present application. The skilled artisan knows the difference between *layers* as they are defined in 1-D models, and *beds* or *layers* as they occur in nature, particularly “thinly interbedded sandstone and shale layers,” and which are classified into *types* in the present inventive method. (There may be many layers in a traditional model, but there may be only two types of beds in the actual earth region – sand and shale.)

***Response to Argument – Prior Art Rejections***

Since the grounds of rejection presented in section (9) of the examiner’s answer restate those in the Office Action mailed Jan. 18, 2006, to which full response was made in the appellant’s Amended Appeal Brief, the appellant will now turn to the examiner’s section (10) where he responds to the arguments made by the appellant in the appellant’s brief.

To begin, the appellant’s arguments are no more reliant on the feature *aspect ratio* than they are on the feature *bed types*, both of which are required in claim 1 as input parameters for construction of a model. (So it is incorrect to state that “the thrust of Appellant’s argument appears to revolve around the ‘aspect ratio’ parameter . . .”) The examiner seems to be arguing that claim 1 of the present application reads on Malinverno’s examples “of shared earth models” shown on the left side of his Fig. 3. These are 2-D layered earth models as discussed above. The only material property (or property of any kind) indicated on the figure and on page 12 is a compressional wave velocity, a value of which is estimated for each layer in the model. The thinnest layer in any of the models is at least 13 m thick. The skilled artisan understands that this is much thicker than what is typically meant by “thinly interbedded sandstone and shale layers.” (See paragraph 5 of the application where an entire analysis interval containing many thin beds is 10 feet or more in thickness.) Thus the artisan would know that the relatively thick model layers shown in Malinverno’s Fig. 3 could not be the thin beds for which the applicants’ claim 1 requires an estimate of bed type and aspect ratio as model parameters. But regardless

of that, Fig. 3 does not suggest any estimation of bed types or any parameters associated with a bed type, and certainly does not suggest estimating aspect ratio as a bed type model parameter. The only quantity suggested as a model parameter (other than layer thickness) in Malinverno's Fig. 3 is compressional wave velocity.

Representing every bed explicitly as Fig. 3 would suggest is not the same thing as classifying the beds according to their type and building a model around bed types and estimated parameters for each bed type as claim 1 requires.

In section 10.1, the examiner writes, "In addition, Appellant has not clarified how the [Malinverno] reference does not disclose finite extent aspect ratios as opposed to an infinite extent aspect ratio." The appellant answers: We can find no express mention of the term "aspect ratio" or beds of finite lateral extent in Malinverno. Of his drawings, only Fig. 3 is relevant to aspect ratio, and frames 42, 46, 50 and 54 all suggest infinite lateral extent, meaning zero aspect ratio. Although the horizontal dimension of 100 m is shown, the ordinary artisan will appreciate this is intended merely to convey the degree of slope of the layer interfaces in this 2D model, and not to convey that every layer starts at  $x = 0$  and ends at  $x = 100$  in a physical sense. Moreover, thinking of the "physical sense" is important. Malinverno's Figure 3 shows layers in a model. The present application's term "aspect ratio" refers to actual beds in the ground, particularly very thin beds, many of which have a lateral dimension not very much greater than their vertical dimension. The ordinary artisan would understand that a layer in a traditional model corresponds to an interval much thicker than the thin beds depicted in the present application's Fig. 1. As mentioned previously, a traditional model (which is all that Malinverno discloses) would divide all of the present application's Fig. 1 into no more than three model layers. Computer resources would make any more explicit representation cost prohibitive. In any event, such more explicit representation of actual lithology would still in no way amount to estimating bed types and bed type parameters including aspect ratio and using these as input parameters to a model (as required by claim 1) instead of the geometric representations of Malinverno's Fig. 3.

The examiner in his Answer quotes almost all of Malinverno's second paragraph on page 8. Except for minor details, the appellant has thoroughly discussed above the actual meaning that the ordinary artisan would extract from this paragraph. All three examples of subsurface models given in that paragraph after the words "for instance" convey no hint whatever of classifying actual beds into bed types, then estimating parameters including aspect ratio for each bed type, then using these input parameters to construct a model (as required by claim 1). The first example is illustrated by Malinverno's Fig. 3. The other two are 3D models where the subsurface is divided into cells (the second example) or may be divided into sub-regions larger than typical grid cells but believed to have approximately constant material parameters (the third example). All three examples are traditional modeling approaches that if they were to be applied to thin beds would have to be applied *explicitly* or else would go beyond anything disclosed or suggested in Malinverno. Paragraphs 4-6 of the present application discuss how accommodations have been made to traditional modeling in the published literature to deal with thin beds. The discussion in those three paragraphs of the present application goes well beyond anything in the Malinverno document toward treatment of the thin-bed problem. But even those approaches offer no treatment of thin beds that have aspect ratios that are not  $\approx 0$ . Those would have to be treated explicitly, which does not involve classifying beds into bed types, estimating parameters including aspect ratio for each bed type, and constructing a model from these bed types and bed-type parameters, as required by claim 1. The appellant believes that no prior art teaches a model based on bed types and bed-type parameters including aspect ratio.

With respect to section 10.2 of the Answer, the present invention's feature of averaging the measured data over the analysis interval is not disclosed by use of Monte Carlo techniques which are in fact used in the present invention also and featured in some claims. The multiple outcomes of stochastic simulations are calculated values of certain quantities that can be measured by well logs and similar techniques. The pertinent claim 3 step is "obtaining average values of the measured well log data over the analysis interval." (Emphasis added) Thus, the examiner's

comment about stochastic processes misses the point in at least two respects. First, his comments refer to calculated values of quantities (which can be compared to measured values in an iterative model updating process). Second, the averaging occurs only in the sense of averaging results from multiple Monte Carlo realizations, which is different in principle from taking the values of a quantity measured at small spatial steps throughout a larger interval, and performing the spatial average of those values over the entire interval.

With respect to section 10.3 of the Answer, the appellant agrees that since the issues in dispute are almost entirely matters of technical understanding (of a rather difficult area of technology) and not of patent law, yes, the appellant was guilty of attempting to be helpful by providing some technical background that extended somewhat beyond the cutting edge for patentability purposes. Nevertheless, the computer resources aspect is relevant in that it helps explain why the ordinary artisan would not read claim 1 to be describing traditional modeling techniques such as are briefly alluded to in one paragraph in Malinverno. Since claim construction is an issue in this proceeding, and since the test for claim construction is what the ordinary artisan would understand, the appellant does not withdraw the comments about computational feasibility.

With respect to section 10.4 of the answer, the appellant has never denied that traditional modeling or the extensions of them that are mentioned in paragraphs 4-6 of the present application can address, to better or worse effect, and at greater or lesser cost in computer resources or data acquisition expense, some or all of the problem of thin beds. But the appellant stands by the view that none of this prior art does this by classifying the thin beds into bed types, and estimating parameters including aspect ratio for each bed type, and constructing a model from these. In other words, claim 1 does not read on any of this prior art. The references to a model of a “subsurface area” in Malinverno’s Abstract and Summary, upon the brevity of which the examiner relies, would be clearly understood by the ordinary artisan to be amplified upon in the second paragraph on page 8, parsed at length above. Thus its vague reference is to nothing more than traditional modeling, where a bed is ignored unless it is represented

explicitly on a very fine spatial grid. In any event, the absence of information in a reference to a model of a “subsurface area” cannot be somehow turned into an affirmative, enabling disclosure of constructing a model by classifying beds into types, and estimating parameters including aspect ration for each type.

With respect to section 10.5 of the answer, the appellant respectfully submits that even if Malinverno discloses (in some manner) “identifying inconsistencies in the measurement data consistent with parameters of the model,” this has no bearing on basing a model upon classifying actual beds into bed types and estimating parameters including aspect ratio for each bed type. Next, the appellant believes that the fact that a claim feature is illustrated in a patent drawing is not considered to be a problem in patent drafting. The appellant’s recourse to a drawing to explain a claim limitation in a previous submittal was an attempt to bridge the gap between lay understanding of a specialized technical area and the understanding of the skilled artisan. In other words, the appellant had an argument to make and wanted to make sure it was understood. The claim states that a model is to be “based upon estimates of different bed types and bed-type parameters in the formation.” The appellant has argued above that this claim limitation would be interpreted by the ordinary artisan consistent with the fuller explanation in the specification, which the examiner admits is consistent with the appellant’s argument. And if the ordinary artisan were in any way uncertain about the claim construction, he would at least understand that these words are not describing traditional model building, and he would then refer to the specification, which is quite proper as a matter of claim construction. On the examiner’s last argument in this section, he seems to be saying that explicit model representation of two depth intervals that happen to have similar properties will result in similar treatment in the model, and this amounts to *de facto* classifying beds according to bed type. The appellant rejects this and other arguments which amount to contending the exhaustive process of developing a very detailed model that explicitly represents thin beds and even high aspect ratios is the same process as developing a much less detailed model that treats the same region in terms of bed types and bed-type parameters. This is yet another argument to the effect that the ordinary artisan would not understand that bed

type and bed are not the same thing and that using bed-type aspect ratio as a parameter in developing the model is not the same thing as constructing such a detailed explicit model that the model could then be used to calculate aspect ratios. On the contrary, the ordinary artisan readily understands the considerable differences between these propositions.

With respect to section 10.6, this section repeats arguments already made and responded to herein. By way of further comment, in terms of how thin beds might be treated, Malinverno does not suggest anything beyond traditional modeling techniques, (which can usefully be described by the term “explicit”) which are briefly alluded to in a few lines in the document.

With respect to section 10.7 of the Answer, the examiner repeats, “Although the claim recites aspect ratio, it does not require it.” This issue has been addressed above in the discussion of the “Summary of Claimed Subject Matter.” The assertion that Malinverno discusses bed types has also been thoroughly responded to.

With respect to section 10.9 of the Answer, the Examiner’s answer has been addressed above in terms of the difference between averaging calculated results and averaging the experimental data used to update the model used to generate calculated results.

With respect to section 10.10 of the Answer, the appellant repeats that its argument revolves around *bed types* as much as *aspect ratio*. All comments by the examiner in this section are addressed above.

***Conclusion***

For the above reasons, the appellant believes all claims should be allowed.

It is believed that no additional fee is required to accompany this Reply Brief. Please charge any fee which may be due to our Deposit Account No. 05-1328.

If Examiner wishes to discuss this application with counsel, please contact the undersigned at (713) 431-7360.

Respectfully submitted,

Date: 23 October 2006

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